

RDM 18 also monitors calls to the local resource interface 32 by input devices and converts the information in the system calls to remote control protocol statements for encapsulation in the transport, network and link layer protocols by browser 30 for transporting across network 14 to AIM 24. AIM 24 then converts the remote control protocol messages to system calls for application program 22 (Block 110, 112). The conversion between the I/O protocol for the application program 22 and remote control protocol continues until the program terminates.

If PTOM 26 is launched with application program 22, it performs the method shown in FIG. 4B. That method begins by determining whether the message to be processed is a remote control reply or a remote control command message (Block 130). If the message is a remote control reply message, it is converted to an AIM reply for the application program (Block 132). If the remote control reply message contains attribute or characteristic information about user system 16 (Block 134), the data are stored in cache memory 84 (Block 136). The AIM reply is then converted to a system call for local resource interface 32 by AIM 24 (Block 138). If the message is a remote control command message, PTOM 20 determines if a parameter stored in the cache memory is being requested (Block 140). If it is, reply generator 82 retrieves the data from cache 84 and builds an AIM reply message (Block 142). Otherwise, the command messages are converted to the remote control protocol (Block 144) and are transmitted across network 14 to user system 16 (Block 146). PTOM 26 continues to convert between the encapsulated system calls and the remote control protocol until the user terminates the application program.

In use, after installation of a browser, a user need not install additional software or provide additional parameters for the remote control of an application program. Instead, a user browses the Internet and, if the site browsed is an RCSP, the user selects the application program. The RCSP transports an RDM to the user system for execution and the RAS launches an application program in response to a request from the RDM. The RDM then converts I/O streams for transporting to the application program launched by the RAS and the AIM or PTOM corresponding to the launched application program provides converted I/O streams to RDM 18. In this way, communication of input and output operations are communicated between the application program and the user system.

While the present invention has been illustrated by a description of various embodiments and processes, and while the embodiments and processes have been described in considerable detail, it is not the intention of the applicant to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art.

What is claimed:

1. A system for on demand remote control of an application program comprising:
 - an application interception module (AIM) for converting between a first input/output (I/O) stream protocol used by an application program and a first remote control protocol, the I/O stream protocol being used to interface the application program to local resources on a first computer; and
 - a remote display module (RDM) for converting between said first remote control protocol and a second I/O stream protocol, said second I/O stream protocol for communicating with local resources for a second computer through a user interface, the remote display

module being transported from said first computer to said second computer for execution by said second computer upon receipt whereby a user at said second computer may establish on-demand remote control of the application program on the first computer to provide input to and view output from the application program at said first computer.

2. The system of claim 1 further comprising:

a remote control service publisher (RCSP) server for selecting and transporting said remote display module in response to a user request for an application program.

3. The system of claim 2 further comprising:

a remote application server (RAS), said remote application server selecting an application program and corresponding AIM for activation in response to a request for activation of an application program from said remote display module, said AIM corresponding to said selected application program communicating remote control protocol messages in said remote control protocol with said remote display module.

4. The system of claim 1 wherein said remote display module is executed by an interpreter in said second system to open an application window for said remote display module in said second computer system.

5. The system of claim 3 further comprising:

a browser at said second computer, said browser communicating with said RCSP to select and receive said remote display module corresponding to said requested application program.

6. The system of claim 5 said browser further comprising:

an interpreter for executing said remote display module received from said RAS.

7. The system of claim 1 further comprising:

a protocol translation and optimization module (PTOM) for converting an I/O stream encapsulated in a second remote control protocol communicated between said PTOM and said AIM to said first remote control protocol.

8. The system of claim 6 wherein said RCSP is a HTTP server and said remote display module is transported across a network to said second computer.

9. The system of claim 8 wherein said remote display module is transported across said network in response to activation of an applet tag of a HTML document.

10. The system of claim 1 further comprising:

a PTOM for reducing communication latency between said first and said second computers; and

a cache memory coupled to said PTOM, said PTOM retrieving data about said second computer from remote control protocol messages from said RDM and storing said data in said cache memory so that said data about said second computer may be communicated to said AIM in response to system calls received from said AIM whereby transmission of said system calls to said second computer are avoided.

11. A method for providing on demand remote control of an application program comprising the steps of:

transporting a remote display module from a first computer to a second computer;

executing said remote display module at said second computer to establish communication between a user

interface to computer resources at said second computer and said first computer through said remote display module; and

launching an application program and application interception module at said first computer to establish communication between said application interception module and said remote display module whereby input/output (I/O) messages are communicated between said application program and said user interface at said second computer.

12. The method of claim 11 wherein said remote display module is transported in an applet file.

13. The method of claim 12 wherein said remote display module is transported in response to activation of an applet tag of a HTML document.

14. The method of claim 11 wherein said remote display module is executed by an interpreter at said second computer.

15. The method of claim 11 further comprising the steps of:

converting I/O messages from said application program to remote control protocol messages for transmission to said remote display module at said second computer; and

converting remote control protocol messages received from said application interception module to I/O messages for said user interface at said second computer.

16. The method of claim 15 further comprising the steps of:

converting I/O messages from said user interface to remote control protocol messages for transmission to said application interception module; and

converting remote control protocol messages from said remote display module to I/O messages for said application program.

17. The method of claim 11 further comprising the steps of:

storing in a cache memory attribute data from remote control protocol messages received from said remote display module; and

retrieving a portion of said attribute data from said cache memory in response to an I/O message from said application program requesting said attribute data.

18 (Amended). A method for providing on demand remote control of an application program, comprising the steps of:

determining that a user at a first computer system desires remote control over an application at a second computer system;

transporting over [said] a network a remote control module to said [second] first computer when demanded by said user, said remote control module enabling said first and second computer system to communicate remotely without pre-installing remote control software at said [second] first computer prior to opening a communication session between the first and second computer; and

executing said remote control module at said [second] first computer to establish a remote control communication between a user interface at said first computer and an application at said second computer.

19 (New). A method for providing on demand remote control of an application program, comprising the steps of:

transmitting a demand that a user at a first computer system desires remote
5 control over an application at a second computer system;

receiving from a network a remote control module onto said first computer after
issuing the demand, said remote control module enabling said first computer and a
second computer system to communicate remotely without pre-installing remote control
software at said first computer prior to opening a communication session between said
10 first computer and said second computer; and

executing said remote control module at said first computer to establish a remote
control communication between a user interface at said first computer and an application
at said second computer.

20 (New). A system for on demand remote control of an application program
operative to execute the method of claim 19.

21 (New). A method for providing on demand remote control of an application
program, comprising the steps of:

determining that a user at a first computer system desires remote control over an
application at a second computer system;

transporting over a network a remote control module to said first computer when
demanded by said user, said remote control module enabling said first and second
computer system to communicate remotely without pre-installing remote control software
at said first computer prior to opening a communication session between the first and
second computer; and

awaiting execution of said remote control module at said first computer to establish
a remote control communication between a user interface at said first computer and an
application at said second computer.

22 (New). A system for on demand remote control of an application program
operative to execute the method of claim 21.